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Latent resources. The morpho-energy of the city

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Synopsis

The European Union has set itself the goal of reducing energy consumption by 27% in 2030 compared to 2013. With regard to the urban dimension, in order to reach this goal we need: on one hand to contain urban sprawl and on the other hand to optimize the performance of urban forms. The French state launched from 2011 to 2016 three cycles of the two-year research program Ignis mutat res *Penser l'architecture, la ville et le paysage au prisme de l'énergie* to explore the relationship between energy systems and the environment. In the framework of the Ignis Mutat Res programme, through the research Mores Mutant ("2013-2015") a multidisciplinary team questioned the constructive and design practices of architects and planners to understand if, and to what extent, the project actions on the building could help activate an energy transition process. The starting point of our work has been to decline the morphological typology of the city in relation to the contemporary topics on the energy transition: the urban metabolism, the energy saving, the energy stockage. The main questions posed by the research were: How does energy innovation manifest itself in the historical city? What is the latent energy potential of the existing urban morphologies? How can the morpho-typological systems transform themselves from energy consumers into energy-producing devices and accumulators? The Ignis mutat res programme explicitly asked to work, in the schools of architecture. The project experimentation, organized at the ENSA Paris La Villette with the Master 2 students, allowed the reformulation of the research topic, the opportunities to experiment new methodological approaches to the topic. Within the workshop of architecture students, it is considered essential to reason on the urban transects in order to develop the reflection on the relationship between urban morphology and the energy transition process. Seven urban sections/ « transect » have been the objective of our work, focusing on the relationship between urban fabric and the context, through three key topics: interface, connections and temporality.

Key words: Synergy, transect, energy.

1. Introduction

The recent Brussels agreement of 24 October 2014 on the reduction of at least 40% of greenhouse gas emissions will be an accelerator of decisions and processes in order to achieve this goal at least in 20 years. With regard to the urban dimension, in order to reach this goal we need: on one hand to contain urban sprawl and on the other hand to optimize the performance of urban forms. The goal is ambitious, and it is now clear that we must also take action on the historic city. How can we intervene while taking into account the constraints on safeguarding heritage and new energy directives? The need to interpret the city not only as a consumer but also as a producer of energy is now a question increasingly acquired by researchers and different political and technical actors. Now the goal is to provide tools to ensure that governance strategy in terms of energy savings is possible, recognizable and feasible. As Sabine Barles argues: *Une première piste de réflexion consiste à ne plus considérer les villes comme des parasites insoutenables, mais comme des gisements de ressources énergétiques et matérielles valorisables, et à mesurer la contribution d'une telle valorisation à la dématérialisation des sociétés* (A first reflection consists of considering cities no longer as unsustainable parasites, but as deposits of energy and material resources that can be valorized, and in measuring the contribution of such an enhancement)¹.

The European Union has set itself the goal of reducing energy consumption by 27% in 2030 compared to 2013. Consequently, France has set itself the twofold objective: the 40% reduction in GES and the halving of energy consumptions by 2050. The French state launched from 2011 to 2016 three cycles of the two-year research program Ignis mutat res. *Penser l'architecture, la ville et le paysage au prisme de l'énergie*. The ambition of this program is to explore the relationship between energy systems and the environment through the funding of research on the energy quality of buildings, cities and landscapes. The main objective of the program is to stimulate awareness on the topic of energy considered in a wide way with all its different economic, political, anthropological and social implications. Ignis Mutat Res - reads in the various calls - opens to possible horizons of an "architecture of energy". The interministerial and interdisciplinary nature of this action responds to the objective of building transversal visions and crossings between different theoretical and technical knowledge (*savoirs et des savoir-faire*) to achieve the qualitative transformation of the architectural, urban and landscape dimension.

2. The Research Mores Mutant

In the frame work of the Ignis Mutat Res programme, through the research Mores Mutant ("2013-2015") a multidisciplinary team² questioned the constructive and design practices of architects and planners to understand if, and to what extent, the project actions on the building could help activate an

¹ cfr. S. Barles, Les villes : parasites ou gisements de ressources?, publié dans laviedesidees.fr, le 25 mai 2010

² Mores Mutant. Mobilité et Réhabilitation : scénarios Mutant.

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energy transition process. Numerous researches show that buildings and urban forms strongly influence energy consumption; but the measures and devices that should be implemented to reduce this phenomenon often overlook some important issues: the sectorial nature of the transformative actions and the devices implemented, and the lack of awareness and knowledge of the users regarding the topic of energy saving and transition.

The starting point of the Mores Mutant research is that energy is a complex phenomenon, at the same time an "element of nature" (Odum 1971) and a "social object" (Missemer 2004), and that in this sense the city can be considered as a "Laboratory of energetic metamorphosis".

The interdisciplinary research group, composed of architects, urban planners, thermal engineers, philosophers, anthropologists and informatics, has worked crosswise on two historical districts of the city of Rome and Paris, respectively, to interrogate the latent energy of urban morphologies and social behavior. The considerable disciplinary diversity has been fundamental since the beginning to define the problematic framework capable of making visible and legible results. The starting point of our work has been to decline the morphological typology of the city in relation to the contemporary topics on the energy transition: the urban metabolism³, the energy saving, the energy stockage. The aim of the research is the existence of a relationship between the morpho-typological aspects, the behaviors aspects and urban "flows" in general; respect to which the architectural project can play a greater role in the construction of the sustainable city, on the condition that it is conceived as an "urban transformation device". The main questions posed by the research were: How does energy innovation manifest itself in the historical city? What is the latent energy potential of the existing urban morphologies? How can the morpho-typological systems transform themselves from energy consumers into energy-producing devices and accumulators, starting from their specific characters? How to optimize and utilize this potential through the realization of minimum interventions?

3. Synergies along the urban transects⁴

The Ignis mutat res programme explicitly asked to work, in the schools of architecture, on the above mentioned research topics in order to raise awareness among students on the topic of energy transition through project opportunities. In the case of our research, the project experimentation, organized at the ENSA Paris La Villette with the Master 2 students, allowed the reformulation of the research topic, and also of some of its objectives and products, and were the opportunities to experiment new methodological approaches to the topic.

Within the workshop, Transition énergétique et politiques stratégiques dans les villes existantes: nouveaux scénarios énergétiques, it is considered essential to reason on the urban transects in order to develop the reflection on

³ cfr. S. Barles, Le Métabolisme urbain et la question énergétique, Les Annales de la recherche urbaine n. 92, 2002

⁴ Cfr. Nicolas Tixier. Le transect urbain. Pour une écriture corrélée des ambiances et de l'environnement, in Barles S. ; Blanc N., Écologies urbaines. Sur le terrain, Economica-Anthropos ; PIR Ville et Environnement, pp. 130-148, 2016

the relationship between urban morphology and the energy transition process. Seven urban sections/ « transect » have been the objective of our work, focusing on the relationship between urban fabric and the context, through three key topics: interface, connections and temporality. The aim was to verify, through the construction of some project scenarios, the latent "energy potential" and/or the deposit of energy existing in the seven urban sections identified as case studies for design experiments.

The building has been considered as an urban interface and the imagined transformations were all concentrated on the relations of the buildings with the outside and therefore towards the sky (the roof), towards the street (the façade and its coating) towards the ground. The open spaces, the different voids between the buildings in the sequence of the urban sections have been re-considered as deposit of latent energy to be re-thought and strengthened in their possibility of becoming "diffusion channels" of the energy flows. The work done, of reading and design, it is more precisely focused on collective, intermediate, in-between spaces, which could be the object of more radical interventions. It has been hypothesized that an exchange of energy in the form of heat exchange can be activated throughout the day (temporality) between different buildings in relation to their different functional uses.

The work on the urban sections allowed us to experiment the possibilities of influencing significantly the energy balance through synergy actions whose impact on the overall budget along the section is visibly higher than the simple sum of the separate actions.

4. Retroactive projects to rethink the urban system of energy

Through the project experiments on urban transects it has become evident how the reduction of energy consumption, in the city and in particular in the historical ones, can be realized through the optimization of the existing urban morphologies and their specificities. The need arises therefore to think of the existing city as *reservoirs de ressources énergétiques et matérielles valorisables*⁵ to be reinvested, and to think the role of the architect and urban planner as an activator of innovative project practices, based on new working methods. This implies a change in the way of thinking about the project, in an interleague way, with attention to the inter-relation of the interventions rather than to the technological and environmental efficiency of the individual interventions.

The research, certainly partial and still incomplete, gives back an attempt to reason in terms of "design system" that images a redevelopment in terms of energy consumption through the intersection of different scales, starting from the specific characters of the existing, rethinking possible relations between urban dimension and energy.

Energy systems, the result of integrated actions on buildings and open spaces, can contribute to rebalancing energy consumption for urban areas. According to these new systems, it will be possible to imagine a new way of

⁵ Cfr.. S. Barles, Les villes : parasites ou gisements de ressources ? dans lavedesidees.fr, le 25 mai 2010

identifying the urban parts (sectors) and the consequent regulatory instruments in terms of sustainable development (energy saving, energy transition).

The strategies on the city will be oriented to the recovery of all sources and energy deposits in the different sectors (parts) of the city. Energy performance will no longer be measured solely in relation to buildings but rather to entire sectors of the city, and will be a more complex but more inclusive and flexible measurement system.

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Biography

Orfina Fatigato. MSc Architect and PhD at the Faculty of Architecture in Naples, she is actually researcher RtdB at the Department of Architecture DiARC, University of Naples Federico II; and she teaches at the Ecole Nationale Supérieure d'Architecture of Paris Malaquais. Her PhD thesis (*La consistenza del vuoto. Riconoscere i vuoti della città, 2008*) focus on several topics that integrates the different dimensions of the description and design of the void spaces in the urban landscape. She has developed her research activity especially in Italy and France. In 2013 she has been post doc fellow in the framework of the programme for foreign researchers Research in Paris, and she has developed the research *The beauty of the void in the Grand Paris*. She is actually researcher at the Laboratory Gerphau, ENSA Paris La Villette. She is member of the International Network *Design Heritage Tourism Landscape and LIEU*.